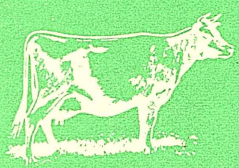
LIQUID MANURE

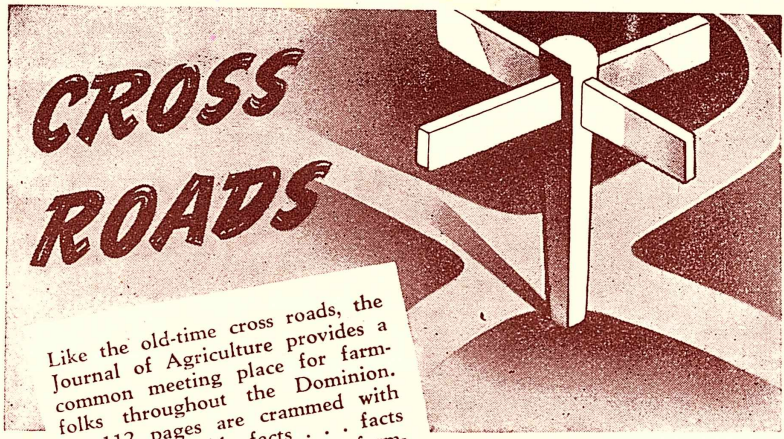
A VALUABLE FERTILISER



Stock Droppings Are Worth £18 of Fertiliser for Every 50 Cows Milked

Bulletin No. 256

N.Z. Department of Agriculture



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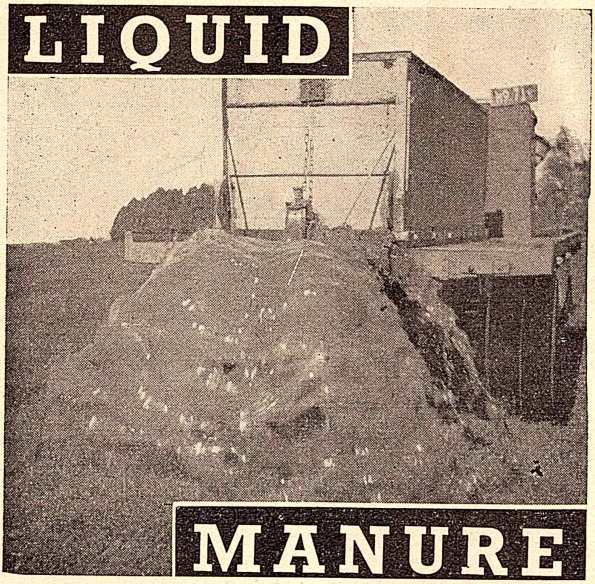
LIQUID MANURE



By
G. A. BLAKE,
Instructor
in Agriculture,
Hastings

THAT it is economically feasible to prevent most of the loss from the droppings and urine voided at milking time has been conclusively demonstrated both experimentally and practically. In this bulletin are presented facts regarding the collection, distribution and value of "liquid manure," this term being synonymous with "shed washings."

ONLY a small portion of the potential pasture-producing and soil-conserving value of the excrement from dairy cows is utilised. It has been estimated that more than 12 tons of droppings and urine are voided by a dairy cow in a year, three-quarters of which is deposited in the grazing fields, where its full value remains unrealised because of improper distribution, even though the higher fertility of those fields used for night paddocks is generally recognised. Enormous losses occur through failure to save the valuable liquid portion through loss of nitrogen in fermentation and drying and the leaching-out of soluble nutrients by rain. Manure dropped on the pastures produces some return provided systematic chain harrowing is carried out, but a regrettably large part of the manure loss results from wasteful methods of handling that portion which is practically all recoverable, that is, the excrement voided in and around the milking shed.

Farmers generally do not understand the true nature of animal manure, and especially the perishable character of its valuable constituents, or the inefficient methods of handling manure would not be so obvious.

The greater ease of maintaining soil fertility under livestock farming than under cash cropping demonstrates the value of animal manure, and it is the proper collection and utilisation of the manure voided at milking time that returns such a dividend in improved pastures and consequently higher butterfat production. Too often are to be seen heaps of farmyard manure thrown over the rails of the stockyard, and in many cases left there for years. This heap is usually only part of what is actually deposited in the shed and yards, and represents the summer and autumn collection

only. The thinner droppings of the spring are usually liquified by the addition of water and washed away into a creek or drain.

While it is admitted that most farmers do periodically remove the heap of animal manure and spread it on the pastures, the area treated is almost negligible, while the material distributed has greatly decreased in value due to the leaching effect of the elements, and the urine—the more valuable product—has been completely lost. The urine is rich in potash and nitrogen, which, being soluble, are readily available to plants, and hence the rapidity with which the plant foods become available is lessened.

Installations

The simplest and least expensive installation, where the contour of the country allows, consists of a distributor into which all the shed washings gravitate, distribution taking place either daily or when the distributor is full. In this type, the distributor is usually a 200- or 400-gallon square iron tank fixed to a sledge or konaki. This method has much to recommend it, as all losses are minimised and the maximum potential fertility effect obtained by spreading the fresh excrement, but the results are slower than when stored manure is distributed.

Although this method is greatly superior to the methods of handling practised on most farms, it has been found that the constant emptying of the distributor becomes irksome, while in periods of extra work, such as during harvesting, the daily routine is neglected. Again, it has to be emptied in all weathers, and unless fitted with wide wheels or runners, will cause cutting-up of gateways and pastures.

The second type of installation consists of a sump in which the shed washings for several days or even weeks can be collected, distribution taking place at any convenient time after a reasonable quantity has been collected. No hard and fast rule can be laid down as to the proper size to make these sumps for different sized herds, but most users prefer one large enough to hold a month's collection. Experience has shown that quicker and better results are obtained when the manure is held in the sump for 14 days before spreading, and from this the value of allowing bacterial action to take place before distribution is evident.

One user of liquid manure with several years' experience is so convinced of the value of holding the manure for a considerable period before distribution that he has recently installed another sump so that he can hold the material longer before application to the pastures, and intends later to install several sumps so that the distribution can be carried out in fine weather only and when other work is not urgently requiring his attention. Farmers are advised to make the sump as large as practicable.

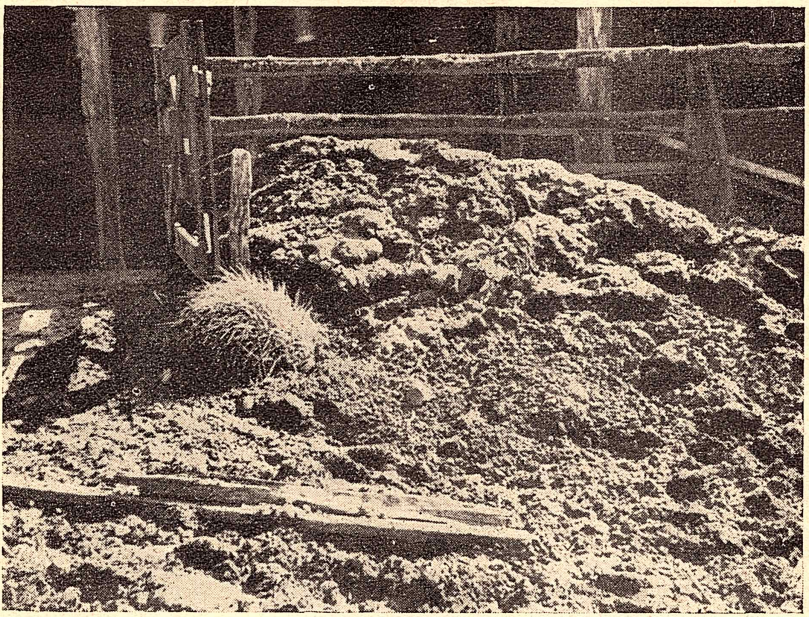
About 2 gallons of water per cow per day are used in washing down, but to this must be added the dropping and urine. A quick method of estimating the approximate capacity of a sump to hold a month's collection is to multiply the number of cows milked by 100, the answer being in gallons.

Dimensions of Sumps

The following table shows the dimensions of popular sized sumps:—

Depth.	Width.	Length.	Capacity. (Gallons).
6ft.	10ft.	10ft.	3,750
6ft.	6ft.	20ft.	4,500
6ft.	12ft.	14ft.	6,300
5ft.	8ft.	8ft.	2,000
6ft. deep	circular,	10ft. dia.	2,944

The most common type is the square or oblong sump, preferably not over 6ft. deep to allow of easy stirring during emptying. By using three bags of cement to a cubic yard of shingle and making the walls and bottom 3in. to 4in. thick, approximately 6yds. of shingle and one ton of cement will provide the material for a sump of 4,000 to 5,000 gallons capacity, which is a popular size. Reinforcing of the walls is necessary, especially at the corners. A slight fall in the bottom of the sump towards the outlet makes for easy cleaning, if necessary.



Heaps of farmyard manure thrown over the rails of the stockyard.

The sump should be covered with a close-fitting lid to prevent in part the loss of ammonia nitrogen by evaporation and as a protection for children and stock.

Where the sump is totally enclosed in the ground and is dug in soil of a clayey nature, the walls may be plastered, but the bottom should be 3in. thick. With this plaster type of wall a round sump is preferable, thus avoiding all corners. Wire-netting of a heavy gauge is pegged to the clay walls with staples made from No. 8 fencing wire, the whole being covered with a concrete mixture thickly enough to cover the netting completely, about 1½in. to 2in. A thin coat of plaster consisting of equal parts of sand and cement is applied later. However, as more skilful labour is required for this type of construction, the cost is practically the same as for the more solid structure. Sumps made by plastering direct on to the clay without netting have not proved satisfactory and have filled with water from the surrounding soil. Unplastered earth sumps have also proved unsatisfactory.

In Switzerland, where the collection of the animal manure is a feature on every farm, the latest development is to collect the shed washings in a septic tank from which the overflow, almost clear liquid, is caught in a sump and later distributed over the pastures, but highly profitable and outstanding results have been achieved in New Zealand without this added expense of constructing a special septic tank. One installation of this type has been erected in Taranaki, but visual results do not appear better than those obtained from the use of the sump only. In this instance, the sump holds 25,000 gallons, and the cost was £150.

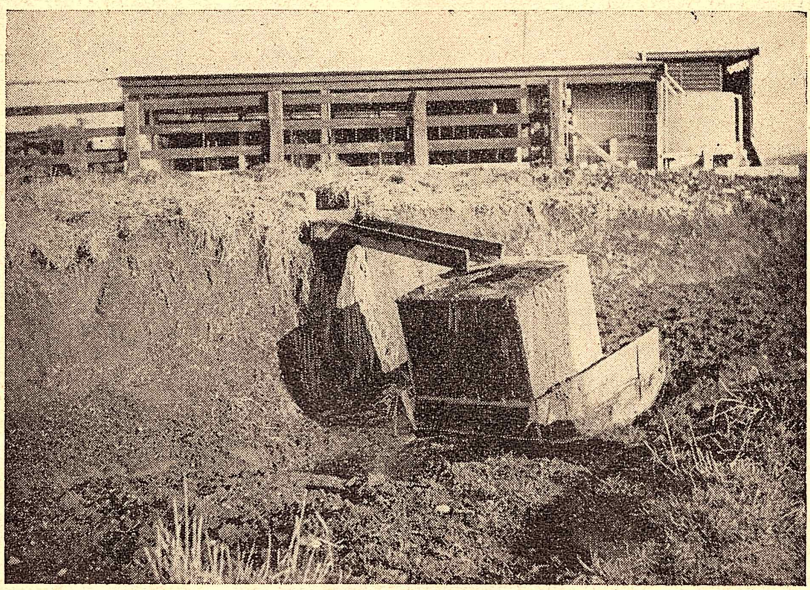
Position of Sump

It should be noted that the Dairy Regulations require the sump to be 30ft. from the shed or yards, so that a sump constructed at the edge of the yard, even though 30ft. from the shed, contravenes the regulations.

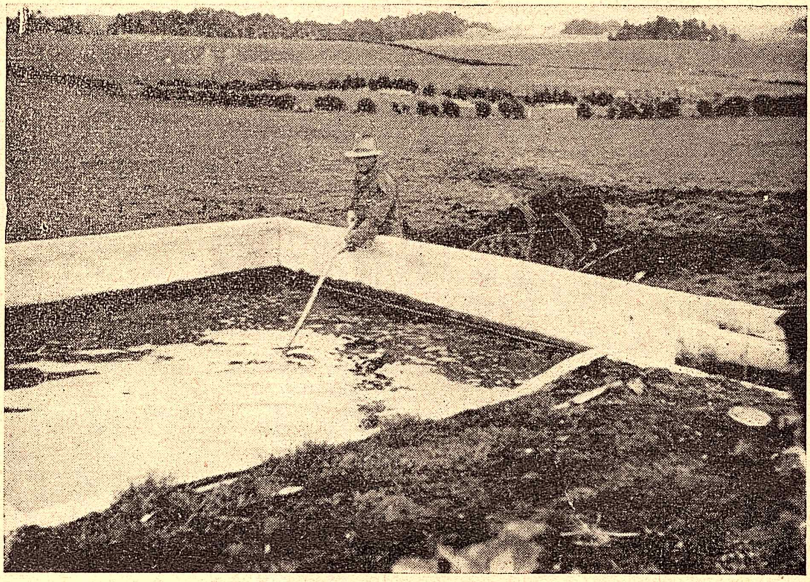
Emptying the Sump

Wherever possible, the distributor should be filled from the sump by

SUMPS

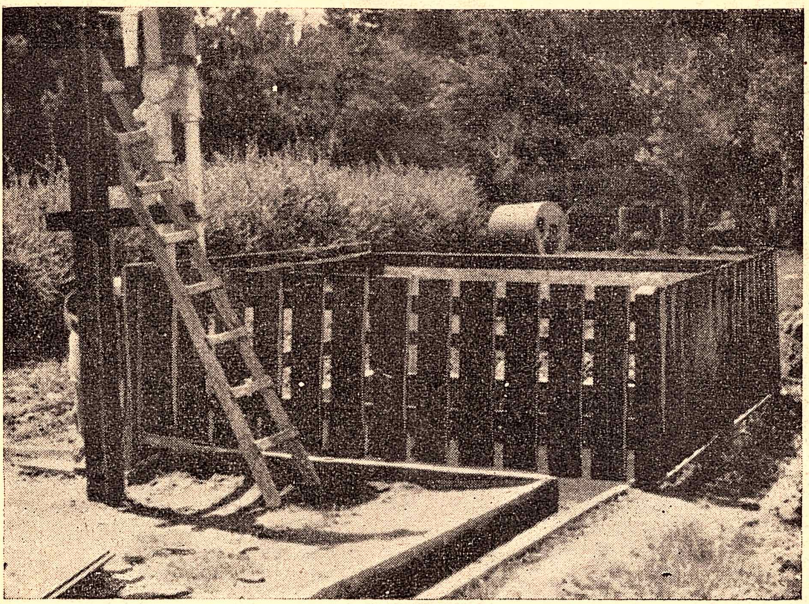


A simple installation where the washings gravitate into the distributor.

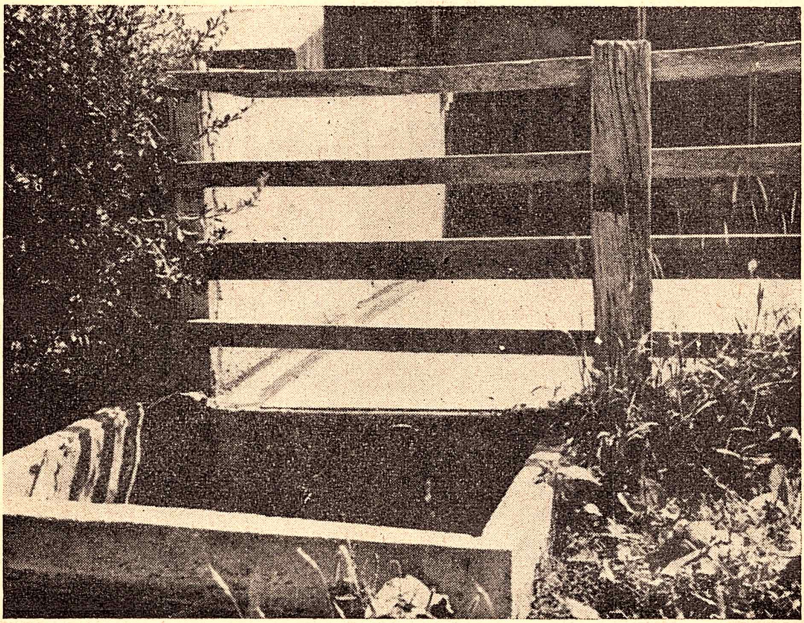


A sump to hold the washings for a month.

SUMPS

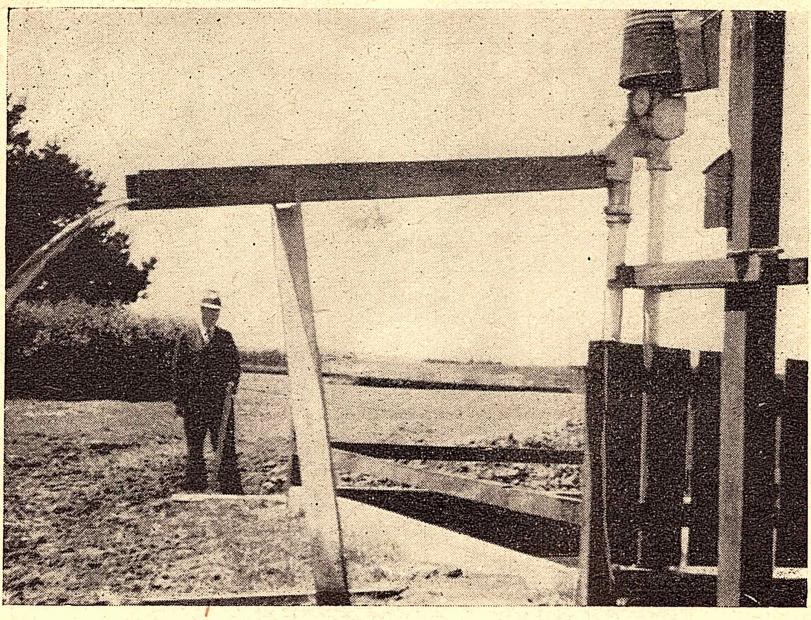


A sump protected against stock and children.

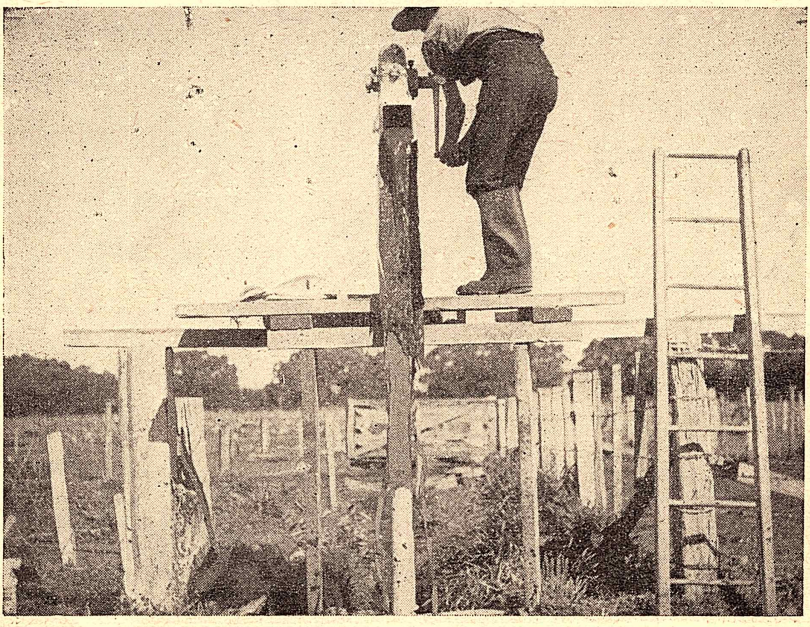


A sump in this position contravenes the Dairy Regulations.

PUMPS



An electrically driven manure pump.



A hand pump is not advised because of the labour involved.

gravity feed through a 3in. tap, which will deliver 100 gallons of liquid manure per minute, or approximately a ton in two minutes. It is not advisable to lead the manure through any great length of piping from the sump to the distributor unless the fall is very steep, as there is always the danger of a blockage, even with a 3in. pipe. To obtain gravity feed into the distributor it may be necessary to construct a special roadway, but if this is done with a bull-dozer, the expense is only a fraction of the cost of a pump, while running expenses are practically nil.

On flat land, however, the only type of installation possible is one which includes a sump and a pump to raise the manure into the distributor. These pumps are the result of years of experimenting and are specially suitable for the work. They are of different types, either hand or electrically driven, and will lift a ton of manure in a few minutes. If electric power is available, the use of a hand pump is not advised owing to the labour involved. Some farmers are using a specially constructed distributor in which a vacuum is created by a milking machine pump, the manure thus being forced up into the distributor, but this type of outfit is expensive, and equally efficient models are available at a considerably lower cost.

Immediately before emptying by whichever method is employed, the material in the sump should be well stirred to break up the thick layer of sediment which usually settles at the bottom.

Daily Routine

Most yard and shed floors have been constructed so that the washings gravitate to one point before being disposed of through a drain. When a sump is installed, fit a board or similar block to the entrance of the drain so that the whole of the washings can be retained on the yard. This will probably mean the erection of a concrete wall about 9in. high at this point, but allows the solids, especially during the summer and autumn months, to be broken up and made more fluid so that they can be easily swept into the sump, and will also more readily flow through the 3in. tap or be lifted by the pump. When the whole of the washings are liquefied, the board or block is lifted and the lot quickly swept along the drain into the sump.

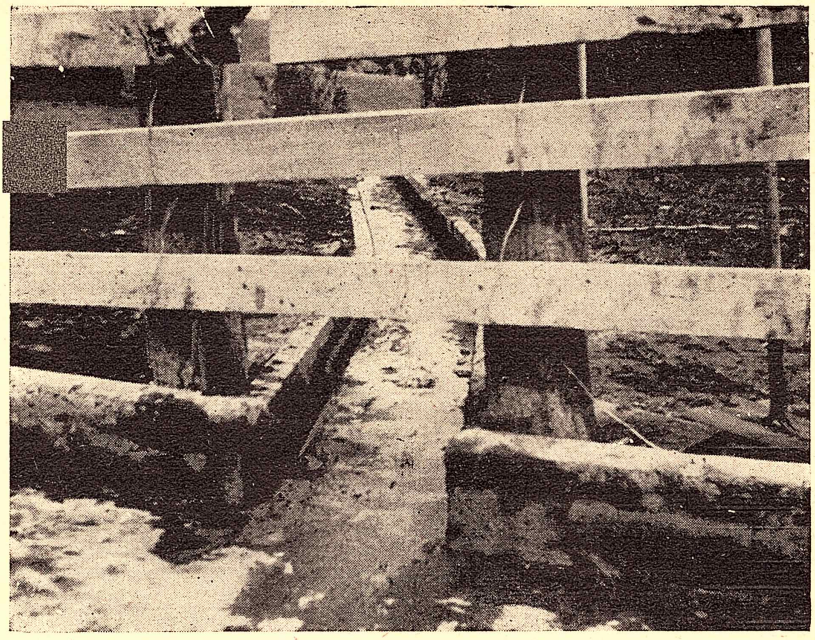
A considerable portion of the droppings is voided close to the shed both before and after the milking period. If desired, these can be collected in a barrow and deposited direct into the sump, where they eventually become broken up and liquefied.

Some sheds are provided with drains at the junction of the shed and yard floors. In such cases, more water than usual is needed, for as soon as a portion of the floor is cleaned the water goes down this drain and more is needed for the balance of the yard. When a new shed is being erected, dispense with this drain, but in place of it build a small concrete wall around the yard. Because of the volume of liquid manure to be swept into the sump, the drain should be wide enough to accommodate the shed broom easily and have walls about 9in. high. Experience has shown that the shallow, narrow drain allows the liquid to slop over the sides. A similar fault also occurs with the wider curved-bottom type of drain.

By-passes

Where the layout is so constructed that all the washings eventually find their way into the sump or distributor, it soon becomes evident that some provision must be made to divert rain or other unwanted water, such as that used for washing the milking plant and cans. When it is realised that with a rainfall of 80 inches a stockyard 33ft. square will catch 200 tons of water a year, the need of some means of diverting it is again evident.

Because no two installations are identical in construction, different types of by-passes have been evolved. The best type so far encountered is constructed by making a slight depression across the base of the drain and placing in this depression a 4in. glazed pipe bend with the flange end flush with the bottom of it and the



A 9in. wall to hold the solids and water on the yard.

A by-pass which allows unwanted water to escape through the side of the drain.

other end leading into a storm-water drain. Between milkings this pipe is left open, but when the drain is needed to carry the manure to the sump a plug is placed in the flange end of the pipe and the manure swept over it.

Another type is constructed by putting the sump alongside the drain instead of at the end of it. A portion of the wall of the drain is movable, and when the sump is needed this portion is removed and placed across the drain to divert the manure into the sump. When storm-water has to be diverted, it simply flows along the drain, past the sump and into a creek, or soaks away. In some installations two drains have been constructed from the yard, one for the manure to the sump and the other for storm-water leading away from the yard. Movable trapdoors are used at the entrances of these drains so that either drain can be closed or left open as desired.

Where the sump is considerably below the level of the stockyard the manure can be conveyed to it by means of 6in. pipes. In these instances another pipe drain of 4in. pipes may be used to divert the unwanted water, and by the use of suitable plugs either drain can be used as desired.

Distributors

The most common type of distributor is the square iron tank, either 200 or 400 gallon capacity, mounted on a konaki. The platform is constructed about 3ft. longer than the tank so that there is ample room in front to allow comfortable standing room for the driver. This is especially necessary when driving through gateways or over bridges. The konaki is fitted with the usual iron skid in front, while the wheels can vary in size from 18in. to 24in. in diameter, but must be fitted with a 6in. tread to lessen damage to gateways and pastures. A 2in. axle is sufficient to support the load. The tank, which is fixed on the back of the konaki, is fitted with a splash-proof lid and a 2½in. or 3in. tap that can be opened or closed quickly by remote control. If procurable, a cheese-vat tap is ideal, but failing this, any straight-through tap is suitable.

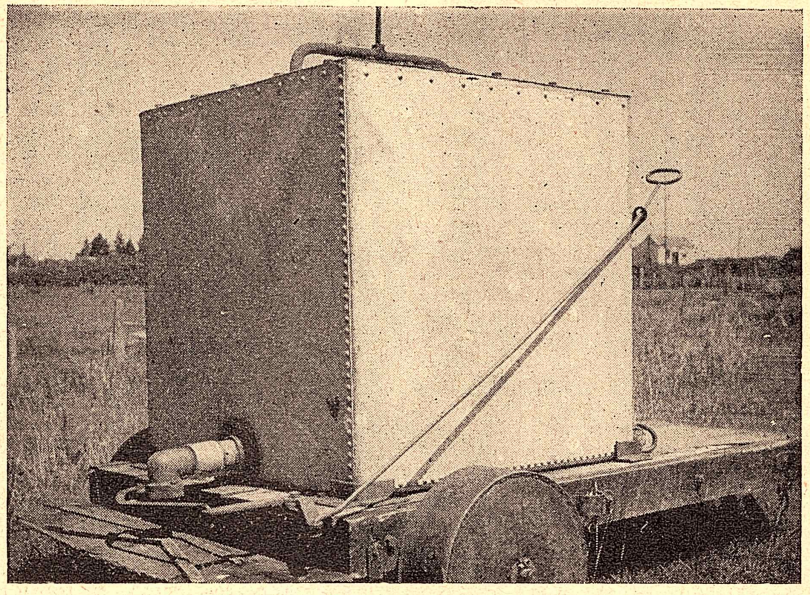
Square iron tanks are in short supply, and if they are unprocurable a distributor can be built with timber. This procedure is necessary in some cases where the fall is too small to allow the use of a tank. These wooden distributors are made from 1½in. timber, and a popular size is 6ft. long by 3ft. wide by 2ft. deep, having a capacity of approximately one ton of manure. In addition to the tap and splash-proof lid, it is advisable to fit two tie-bolts of ½in. iron across each end of the box so that if shrinkage occurs the bolts can be tightened and the joints again made waterproof. For this purpose, the sides of the box should project about 3in. beyond the ends and all other parts of the box, including the top and the bottom, should be built between the sides.

If the country is undulating and much surging of the liquid is likely in the box, baffle plates should be fitted to the inside to reduce wear and tear on the distributor. These plates are made from 1½in. timber, and are placed 2ft. from each end of the box and right across it but 1in. below the top to leave an air vent and about 8in. from the floor to allow sufficient room for the periodical removal of the sand that settles in the distributor.

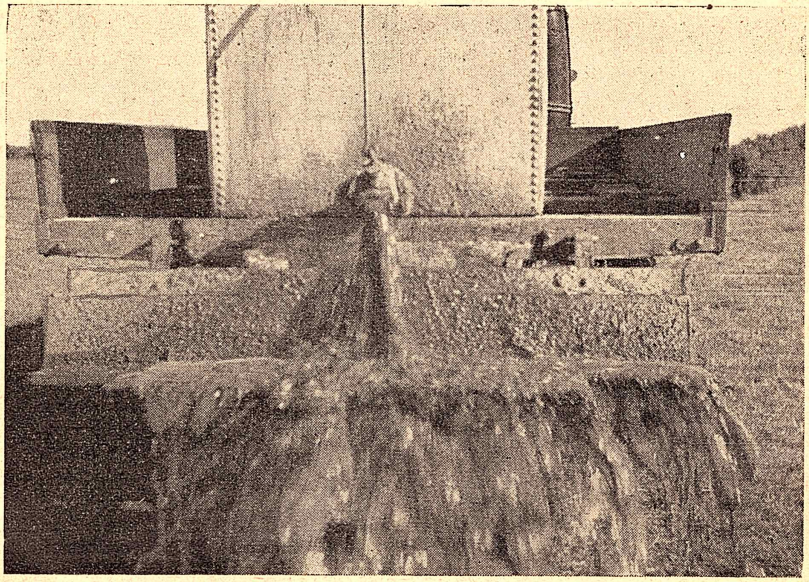
A distributor may be mounted on a sledge, a konaki, a wagon, or a motor-lorry, so that in most cases the type of conveyance already in use on the farm is suitable. The sledge and the horse-drawn wagon both have a common fault in that the tyres or runners are too narrow for use in wet weather, both tending to cause damage to gateways and pastures.

Amount to Apply

The amount of liquid manure applied per acre varies within small limits, and experience has shown that from 3,000 to 4,000 gallons are required to treat one acre adequately. The best results from one application have been obtained from a distributor fitted with a 3in. tap drawn at a working pace for horses—that is, about 3 miles per hour and having a spread of 6ft. If this quantity is

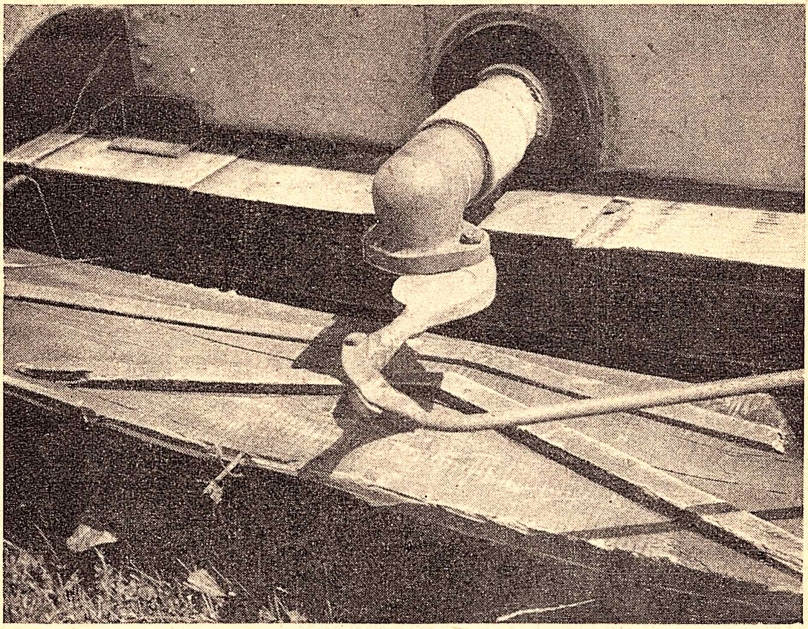


The most common type of distributor is the square iron tank fitted to a konaki.

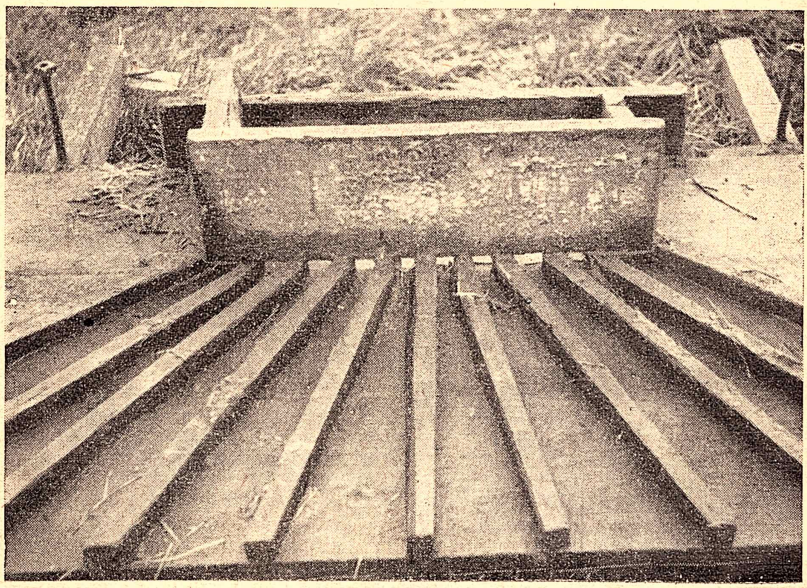


A distributor mounted on a motor-lorry.

Spreader Boards



A spreader board for use with a sledge or konaki.



A spreader for use on a lorry or waggon where the tap has a vertical delivery.

applied, it will be found that 200 gallons, or 1 ton approximately, will cover a strip 7 chains long by 6ft. wide. Heavier applications do not give a noticeably better result, while lighter dressings little more than maintain the sward in its present condition.

Different soil types, however, may respond to lighter dressings, but this can be ascertained only by individual trials. Many users maintain that after four annual dressings the sward has been so improved that further applications are unnecessary for some time, and all agree that it is a better policy to cover all the topdressable area of the farm gradually with one dressing than to concentrate on the same area year after year.

In very few cases is the capacity of the sump sufficient to treat a whole paddock, so that some time elapses from commencing until the field is completed. During this period it is not necessary to remove stock unless desired, as they neglect the newly treated area for about a fortnight, after which it is relished more than any other part of the farm.

Again, unless the sump is of exceptional capacity, distribution usually takes place monthly, so that no special period can be recommended for using liquid manure, but users affirm that the autumn supply should be used for promoting a growth of grass and clover to be utilised in the spring when the herd has again come into profit, and consider that this practice alone more than pays for the cost of the installation. In other words, it takes the place of ammoniated super but without any of its ill-effects. In an actual trial it was found that one application of liquid manure at the rate of 4,000 gallons per acre grew as much grass as 2cwt. of sulphate of ammonia per acre, in addition to which the sward was left in a better condition and again responded quickly, a feature not found with the artificial stimulant.

Spreader Boards

The types of spreader boards in use are many and varied, some being more efficient than others. From this collection three types have been selected as being the most suitable under different conditions.

Where the distributor is close to the ground, as when mounted on a sledge or konaki, the spreader consists of a board 12½in. wide by 1in. thick fixed 3in. to 4in. below the outlet of the tap and extending to the width of the conveyance. This board is fitted with cleats or slats of 1in. by ½in. timber radiating from where the manure drops on to it. This size is suitable only if the tap projects the manure on to the board in a vertical stream. If a cheese-vat tap is used the width of the board must be increased to 18in.

Where the distributor is mounted on a wagon or motor-lorry and is fitted with a cheese-vat tap, the type of spreader recommended consists of a curved metal plate 3ft. long, semi-oval in shape, 20in. wide, in front of the tap. The straight edge or axil line of the oval is fastened to the distributor as close up under the tap as possible. The outer edge is suspended on two wires or chains so that the curve can be altered to give the desired spread. This spreader is easily manufactured on the farm from the side of a 40-gallon molasses or tar barrel.

The third type of spreader for use on a wagon or lorry where a tap with a vertical delivery is used is a modification of that used on a sledge or konaki. In this case the spreader board is 18in. to 24in. wide and 6ft. long. A box 18in. long, 6in. deep, and 6in. wide is built on the spreader board near the distributor but with the front side raised 1in. from it. The manure falls into this box and thus finds its way out through the opening between the front of the box and the spreader board, and is then controlled by 1in. by 1in. slats radiating from this opening to the edges of the spreader board.

Results

The results from the use of liquid manure at the recommended rate per acre—3,000 to 4,000 gallons—are outstanding, and in no case investigated could the same results have been obtained from artificial manure. Even under very adverse weather conditions, a distinct change in colour to an emerald green has been noted 13 days after application. This is followed by a big increase in the clover-

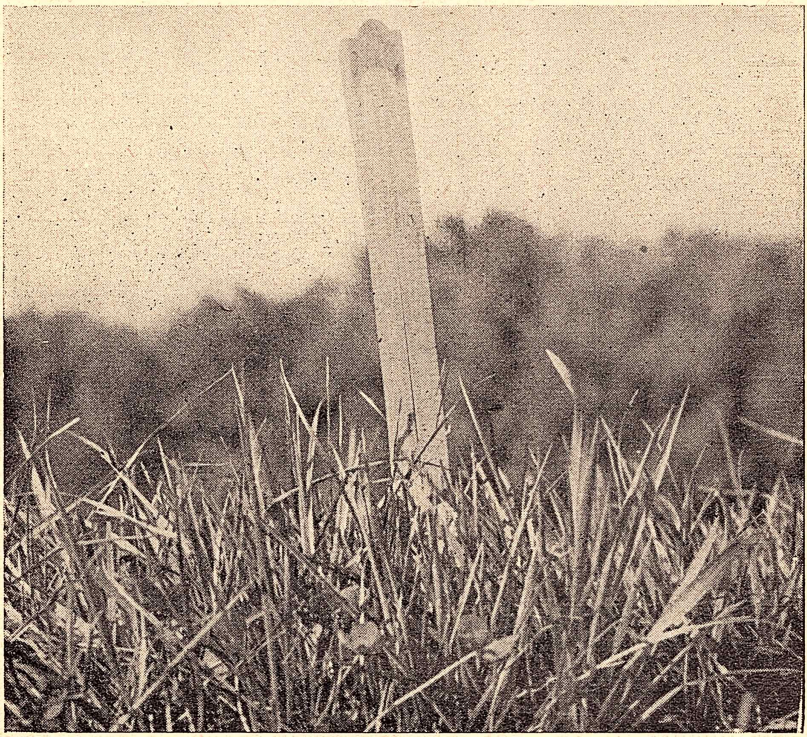
content of the sward, with a natural filling-up of bare spaces. With the presence of this extra clover, the grass plants are invigorated and a dense sward results. The farmer's aim to make two blades of grass grow where only one grew before is actually realised. When used on a deteriorated sward containing many flat weeds, the weeds are invigorated, but the growth of grass and clover tends to make them grow in a more upright position, thus reducing the area occupied by them. In many cases, paddocks which would normally require ploughing have been brought back into good productive areas by the use of liquid manure, while hay paddocks which have been cut for several years and are usually deficient in clover have been so improved that heavier crops than ever before have been harvested after its use.

A measured growth of 9in. of ryegrass and white clover has been obtained in two months from one application of liquid manure during the late autumn, while in the same field the growth on the cocksfoot plants was 18in. high. Untreated adjoining fields, although closed to stock, showed practically no growth during the same period.

Liquid manure also has a considerable value for cropping, but the best results are obtained when the manure is applied before ploughing. Thus, for those farmers who are growing sugar beet, mangolds, or carrots, good crops can be obtained in spite of the rationing of phosphatic manures.

Fertiliser Value

The fact that as yet a very small proportion of dairy farmers, even in these days of drastically-reduced supplies of artificial fertilisers, have equipped their farms with the means of collecting and distributing the shed washings makes it clear that some more definite information is required



A measured growth of 9in. of ryegrass and clover in two months.

Even Liquid Manure

won't put back

all the minerals

Every year a cow consumes the equivalent of 26 lbs. of phosphoric acid, 93 lbs. of potash and 37 lbs. of calcium. Liquid manuring does help to return some of this to the soil—but it can't put back the mineral salts contained in the milk. It's easy to ensure that the animal's intake never falls below the balanced proportion necessary.

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by them as to the real value of this material which is regularly washed away into streams and drains from the great majority of our dairy farms.

The experience of the pioneers in the use of the washings from the cowshed and holding yards on dairy farms in New Zealand has resulted in a relatively slow extension of the practice where the results obtained by topdressing of pastures and the fertilising of crops with this liquid manure have given outstanding results easily seen and understood by neighbouring farmers.

Every good gardener knows the value of liquid manure (animal droppings and water) and would give almost anything to have a regular supply. He envies the farmer who can let tons of excellent manure go to waste each year.

Records and Observations

To ascertain the actual manurial value of the shed washings in terms of nitrogen, potash, lime and phosphate and to gain some accurate details of the quantities that the average dairy farmer is wasting each year the writer arranged with two dairy farmers in Central Taranaki to keep the necessary records of the amount of liquid manure they obtained during the year from their respective herds. The shed washings were collected in each case in a sump to hold between 5,000 and 6,000 gallons. Samples of the liquid manure as it came from the sump for distribution on the pastures were taken each month and a complete analysis was made of each sample by the Department's chemist.

The measurement of the quantity of liquid manure, together with the analysis of the samples, has given some very interesting and instructive indication of what liquid manure so collected does actually contain in the way of fertiliser.

The observations and records were made on the farms of Messrs. R. Haseltine and L. Craig, Pukengahu, who are both firm believers in the value of this manure on pastures. To these farmers the thanks of the writer for their assistance and co-operation are recorded.

Mr. Haseltine's farm is typical of many of the smaller high-producing properties of Central Taranaki, having been heavily limed and well topdressed with phosphates over a number of years, while Mr. Craig's farming is on a larger scale and much less lime and phosphate have been used in the past.

These differences in liming and topdressing are very clearly shown in the results of the analysis of the liquid manure from each farm. Undoubtedly the quality of the pastures does affect the quality of the animal manure obtained from the stock depasturing on them.

Results of Analysis

In the following table the quantities of liquid manure collected on each farm are recorded for the months of August to May in the case of Mr. Haseltine's farm and for September to May for Mr. Craig's farm. The manurial content of the material collected each month is set out in terms of well-known fertilisers. Nitrogen is expressed as sulphate of ammonia and dried blood, phosphates as superphosphate, potash as 30 per cent. potash salts, lime as carbonate of lime, and magnesium as magnesium sulphate.

On No. 1 farm (Mr. Haseltine's) the total of 46,000 gallons of liquid manure was collected from a herd of 55 cows over the ten months for which records were kept. The sump, holding a little over 5,000 gallons, was large enough to hold the shed washings for one month, and with the distributor employed, the spreading of the manure from the sump took only a few hours once a month. At an average application of 4,000 gallons per acre, some 11 acres of the farm received a dressing containing, on the average, the equivalent of nearly 1cwt. of sulphate of ammonia, more than ½cwt. of superphosphate, a little less than 1cwt. of 30 per cent. potash, more than ½cwt. of lime and ¾cwt. of sulphate of magnesia.

On No. 2 farm (Mr. Craig's) a total of 48,600 gallons was collected from a herd of 71 cows. Here, because of the greater average distance from the pasture to the milking shed, much more of the droppings were deposited on the way to the shed. On this farm about 12 acres were topdressed at the

NO. 1 FARM.

Month.	No. of Cows.	Gallons of manure.	Sulphate of ammonia. lb.	Dried blood. lb.	Super. lb.	30% Potash. lb.	Lime. lb.	Mag. Sulph. lb.	Total. lb.
August	54	3,000	106	340	57	84	62	59	602
September	55	5,000	176	566	95	140	102	97	1,000
October	55	4,000	141	453	76	112	82	78	801
November	55	5,000	170	600	106	168	101	111	1,086
December	55	5,000	75	311	53	91	60	68	583
January	50	5,000	151	354	54	100	61	85	654
February	50	4,200	42	379	74	107	88	102	750
March	50	3,500	48	312	67	76	36	81	572
April	50	4,500	108	520	118	124	106	96	964
May	30	4,800	36	137	28	54	30	41	290
Totals		46,000	1,053	3,972	728	1,056	728	818	7,302

NO. 2 FARM.

September	65	3,400	137	366	42	134	30	48	620
October	71	6,000	241	646	74	237	52	84	1,093
November	72	6,000	224	635	91	275	59	89	1,149
December	71	6,500	196	434	31	219	28	57	769
January	71	5,300	175	390	35	182	44	78	729
February	71	4,000	74	326	23	166	30	50	595
March	68	6,400	99	278	32	93	18	54	475
April	65	6,000	224	606	87	197	69	90	1,049
May	45	5,000	141	305	25	130	21	46	527
Totals		48,600	1,511	3,986	440	1,633	351	596	7,006

rate of 4,000 gallons per acre, resulting in an average distribution of over 1cwt. of sulphate of ammonia, about 36lb. of super, 1¼cwt. of 30 per cent. potash salts, 30lb. of lime, and 50lb. of sulphate of magnesia per acre.

In both cases, although the phosphate and lime content of this mixed fertiliser dressing is somewhat low when compared with such applications as 3cwt. to 4cwt. of superphosphate and 5cwt. to 6cwt. of lime per acre each year, the fact remains that a dressing of 4,000 gallons per acre of liquid manure collected as shed washings gives outstanding immediate results and on the two farms under observation the results of one application have been conspicuous after two years.

It is considered from observations on these and other farms that a decided improvement in the growth and density of the sward can be expected for three years from one application and that a satisfactory maintenance of the improvement can be obtained by triennial dressings. The limited quantities of phosphate and lime in liquid manure are apparently readily available, but the sustained improvement is probably due to physical and biological changes brought about by its use. There is also the probability that manure carries small quantities of growth-promoting substances which act in a manner similar to vitamins in animals.

With triennial dressings, these two farms are thus able to improve and maintain the improvement on 30 to 40 acres.

Value in Money

Considering the monetary value of the liquid manure as an offset to the cost of the sump and the distributor and the time taken to spread the manure, the following calculations, based on present costs in terms of artificial fertilisers contained in the liquid manure from a herd of 50 cows, demonstrate that those farmers who are collecting the shed washings and distributing them on their pastures are not actually wasting time and money.

Based on the average for the 126 cows on the two farms under observation, each 50 cows produced per annum the equivalent of ½ ton of sulphate of ammonia costing £12 10s., ½ ton of 30 per cent. potash at £5, 4cwt. of superphosphate at 16/-, and 4cwt. of lime at 4/-, a total of £18 10s worth of fertiliser. The cost of the sump and distributor on the farms under review was about £30 in each case, and the labour in distribution about four hours per month. In two seasons the cost of the equipment and of labour for distribution was ade-

quately met, leaving future costs for many years those of distribution only.

From £18 to £20 for every 50 cows milked may not appear very much to be wasting each year, but for the 1,800,000 dairy cows of this country the loss of the manurial value of the stock droppings in and around the cowsheds adds up to the tidy sum of £60,000 to £70,000 annually.

Since this investigation was carried out some farmers have constructed a holding yard behind the cowshed, and the extra voidings so collected have almost doubled the amount previously collected.

Trials with Liquid Manure

In order to determine the exact increase brought about by the use of liquid manure a trial was carried out on the Stratford Demonstration Farm. Two areas of a deteriorated sward were treated with one application of liquid manure and two similar areas in the same field remained untreated as a control. Wire netting frames, periodically shifted to new positions, were used to prevent stock from eating the growth, which was mown and weighed at intervals.

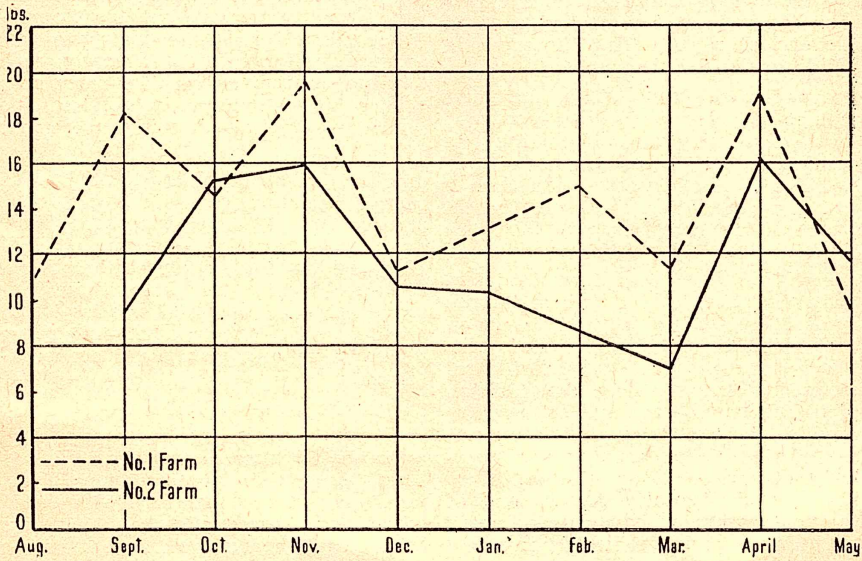
The following is a summary in seasonal periods of the yields of green weights from the trial for one year from the commencement on March 16, 1942:—

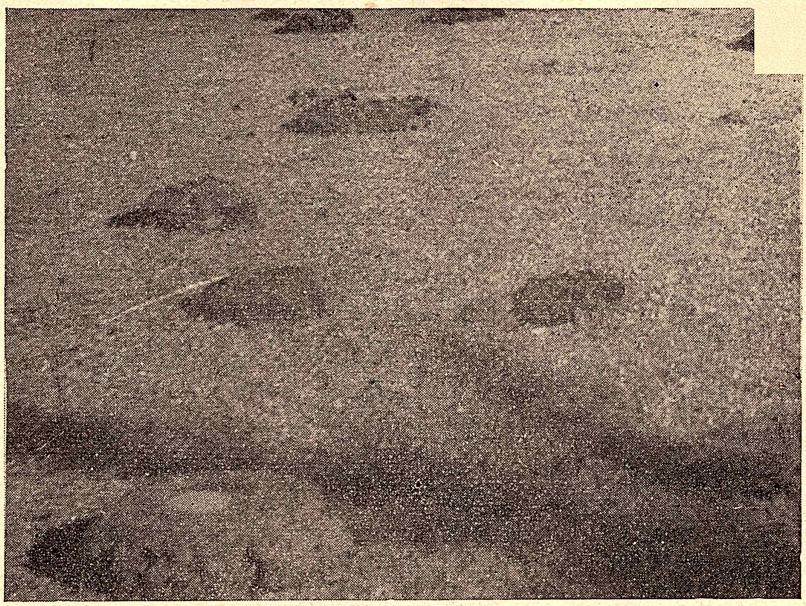
Date of Weighing.		Yields in lb. per acre. Liquid Manure.	Control.
Autumn	30/3/42	2,448	1,224
	7/4/42	1,152	792
	16/4/42	1,584	1,152
	27/4/42	720	504
	13/5/42	720	576
	2/6/42	576	648
Winter	3/9/42	1,440	1,296
Spring	18/9/42	936	864
	6/10/42	1,440	1,368
	23/10/42	3,528	2,880
	10/11/42	3,024	2,736
	2/12/42	2,304	2,376
Summer	18/12/42	2,088	2,376
	8/1/43	1,872	1,584
	29/1/43	2,160	1,728
	12/2/43	1,584	1,728
Autumn	19/3/43	5,112	4,320
Grand Total		32,688	28,152

A study of this table reveals three outstanding facts:—

1. **The immediate result.**—Within fourteen days of application exactly

TOTAL PRODUCTION PER COW PER MONTH OF FERTILISER & LIME.





Three-quarters of the droppings are voided in the grazing fields.

twice the amount of grass and clover was produced on the topdressed area as on the control.

2. **Sustained production.**—At practically every weighing through the year the treated area produced a greater weight of grass and clover than the untreated area, and even at the end of a year the differences in yields are still pronounced.

3. **Increased Yield.**—The increased weight of grass and clover produced in the first year alone from the one application of liquid manure was 4,536lb., or considerably more than 2 tons per acre. This represents an increase of 16 per cent. above that produced without liquid manure.

Two trials were laid down to determine the effect of one, two and three applications of liquid manure to an area within one year. The area selected for one trial was a fertile reclaimed swamp, where the addition of liquid manure was not expected to produce the best results. Contrary to expectations, a rapid growth, particularly of white clover, resulted from the first application. At the end of the trial no differences could be noted between the areas receiving two and three applications, but both were slightly better than the area receiving only one application. The second trial was laid down on a deteriorated pasture on the slopes of Mt. Egmont at an altitude of 1,400ft. above sea level. Here, the results of the other trial were repeated, but the impression gained from these trials was that it was better to treat a larger area only once than to treat the same area twice, as the differences between one and two or three dressings were not outstanding.

Each of the plots treated with liquid manure was crossed with treatments of superphosphate, lime, and a combination of both. It will be seen from the analyses that liquid manure is low in both these ingredients, and this trial was instituted to determine what result would occur from their use with the shed washings.

Results were as follows:—

Superphosphate at 3cwt. per acre plus liquid manure produced slightly more grass than liquid manure alone.

Lime at 10cwt. per acre plus liquid manure produced slightly more grass than liquid manure alone, but not as

much as when superphosphate was used.

Superphosphate at 3cwt. per acre plus lime at 1 ton per acre plus liquid manure produced more grass than any other treatment, but the increase over liquid manure alone is not considered sufficient to advocate the use of either lime and/or superphosphate on areas treated with liquid manure, especially while stocks of artificial manure are low.

Shed washings were also used in a trial on sugar beet, but as no yield weights were recorded the results of the different treatments could not be accurately estimated. From the various treatments, however, the area which received liquid manure before ploughing, followed by another dressing three weeks after germination, was conspicuously better than all other plots.

General

The question has often been asked, "Will the use of liquid manure spread such diseases as mastitis and tuberculosis?"

It often happens that strippings from infected quarters find their way into the sump, but on farms where the use of liquid manure has been a feature for many years these diseases have not caused more trouble than before its inception. Often the reverse is the case and the herd is freer from these troubles than before. Where the liquid manure is stored in a sump for some time before distribution, it is very probable that disease germs are destroyed there. A parallel instance can be found on sewage farms, where outbreaks of disease are practically non-existent.

The presence of viable weed and clover seeds in liquid manure is known, and for this reason its use on lucerne areas cannot be recommended.

Conclusion

Practical experience has shown that the manure from the milking shed and yards has a real and satisfactory value for pasture topdressing and for enriching areas of land intended for growing root crops, and is best applied in the liquid form.

The greatest benefit from its use is realised only when it is combined with good pasture management. It will not take the place of rotational grazing, chain-harrowing, drainage or correct utilisation of the herbage produced, but combined with these, maximum returns from liquid manure are assured.

Another very important and striking feature where the washings from the shed and yard are properly collected and regularly distributed is the remarkable improvement in the general condition of sanitation in and around the milking shed.

Construction of Liquid Manure Distributor

By C. R. TAYLOR, Fields Instructor, Rotorua.

TO assist farmers who may wish to construct a liquid manure distributor the following details are given.

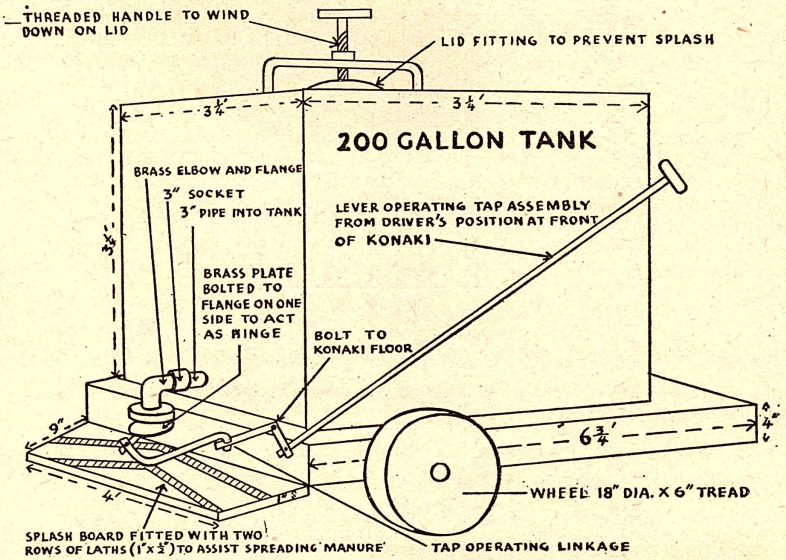
The konaki is constructed with a platform approximately 3ft. longer than the tank to be used so that there is sufficient room in front to allow comfortable standing accommodation for the driver. The front end of the konaki should be furnished with the usual iron-shod skid, while the axle should be placed well to the rear to secure the necessary balance. Wheels should be from 18in. to 24in. in diameter with a 6in. tread and supported on an axle of 2in. diameter.

Where the distributor is to be drawn by horses the tank should not exceed a capacity of 200 gallons because of the weight involved, which is well over one ton when fully loaded. For preference, the tank, which can be made of either galvanised iron or wood, should be of the square type so as to reduce as far as possible the surge that takes place while the dis-

tributor is being driven along. Tank fittings should consist of a lid fitting close enough to prevent excessive splashing, and a tap of between 2½in. and 3in. diameter, the latter being preferred. If an old tap from a cheese vat can be procured, this is very suitable; otherwise, a brass fitting should be purchased, as iron taps soon rust and leak. The accompanying diagram illustrates a serviceable type of tap assembly together with the necessary control fittings. Construction details of the konaki are also shown.

It will be noted in the diagram that the brass flange piece and plate, which are lightly bolted together at one end of flange only, actually form the tap, and this is operated from the front of the konaki by movement of the lever through the linkage provided. The splash or spreader board, which should not be more than 4ft. or 5ft. long, is made from 9in. x 1in. timber, and is placed about 3in. below the tap and from 6in. to 9in. from the ground. Slats 1in. x ½in., as shown, are fixed to the board to assist in spreading the liquid manure evenly. The tank is held in position on the konaki by pieces of angle iron bolted to the floor at the corners of the container. To prevent splashing from the top of the tank, a simple arrangement is provided which is self-explanatory.

The manure distributor described is large enough for a shed milking 100 cows when emptying is contemplated daily. This provides for 2 gallons of washings per day per cow. The drain from the shed to the tank should be wide and flat so that tank should be wide and flat so that it may be swept down with a broom. It is also essential that provision be made to divert rain water from the tank when necessary. At all times avoid over-dilution of the manure by using just that amount of water necessary to maintain thorough shed cleanliness.



Constructional details of a liquid manure distributor.

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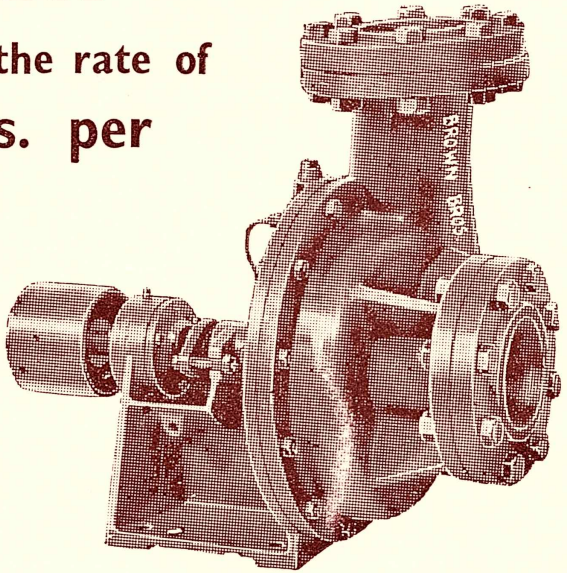

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